UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/752,158	12/29/2000	Robert S. Young,Jr	ASF99246 (021971.0166)	8450

7590 02/13/2004

RAYMOND M. GALASSO
SIMON, GALASSO & FRANTZ PLC
P.O. BOX 26503
AUSTIN, TX 78755-0503

EXAMINER	
SIANGCHIN, KEVIN	
ART UNIT	**PAPER NUMBER**
2623	

DATE MAILED: 02/13/2004

8

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/752,158	Applicant(s) YOUNG,JR ET AL.	
	Examiner Kevin Siangchin	Art Unit 2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-45 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-45 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 29 December 2000 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4,5 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Detailed Action

Drawings

1. The drawings are objected to because, in Fig. 1, the text of reference numbers 36a and 36b is too light to be reproduced properly. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claims

Objections

2. Claim 15 and 30 are objected to because of the following informalities. Claim 15 states "at least two adjacent values from *the least* a portion of a row" (page 38 lines 16-17) where it should state "at least two adjacent values from *at least* a portion of a row".

3. Claim 30 refers to the method of claim 19. However, Claim 19 claims a system. It is assumed, hereinafter, that the applicant intended to claim a system, as opposed to a method, in claim 30. Appropriate correction is required.

Rejections Under U.S.C. § 112(2)

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention

5. Claim 3, 18, 33, and 31-45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. *The following is in regard to Claims 3, 18, and 33.* Claims 3, 18, and 33 claim a method, system, and digital image, respectively, which comprise "positioning the feature in the location". It is not clear as to what

location the applicant is referring. It will be assumed, hereinafter, that "positioning the feature in the location" means "positioning the feature in the location of the feature on the film".

7. *The following is in regard to Claims 31-45.* In these claims, the applicant claims a "digital image comprising...". Typically, a digital image is understood to be an array of pixels. The applicant claims a digital image comprising various components (e.g. a computer readable medium) and operations (e.g. adjusting the image data in response to a reference feature...), in Claim 31 and subsequent claims that are not attributable to typical digital images. For the remainder of this document the digital image claimed in Claims 31-45 will be treated as a system or apparatus that supports digital images.

Rejections Under U.S.C. § 102(b)

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claim 1-4, 7-8, 10, 16-19, 22-23, 25, 31-34, 37-38, and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Edgar (U.S. Patent 5,519,510).

10. *The following is in regard to Claim 1.* Edgar discloses a method for electronically developing an image recorded on film, wherein the film is scanned at various times during the development process. The method is shown to improve the quality of the image data (see, for example, column 7, lines 1-10 of Edgar) and further comprises:

a. Identifying a reference feature whose characteristics are invariant as the film develops. See *ARTIFACT DEFECT CORRECTION*, columns 6-7 of Edgar.

There the reference feature is taken to be *defects in the film base* (e.g. scratches). These are further shown to be fixed (invariant) as the film develops (e.g. Edgar column 7, lines 9-11)†.

b. Adjusting image data in response to the reference feature (Edgar column 7, lines 12-36), the image data and the reference feature captured from the film while the film has developing chemical applied thereto (Edgar, *ELECTRONIC FILM DEVELOPMENT,* in particular column 6 lines 25-29 and 57-64).

Thus, Edgar teaches all aspects of claim 1.

11. *The following is in regard to Claim 2.* As shown above, with regard to claim 1, Edgar discloses a method, in accordance with claim 1, such that the reference feature is a film defect. Therefore, Edgar teaches a method, in accordance with claim 1, wherein the feature comprises a *film defect* (Edgar, column 6, lines 65-67 to column 7, lines 1-11). Thus, Edgar teaches a method in accordance with claim 2.

12. *The following is in regard to Claims 3- 4.* Edgar discloses a method, in accordance with claim 1, further comprising locating the film defect (i.e. the reference feature) on the film. See Edgar, Fig. 5B and in columns 6, lines 65-67 to column 7, lines 1-35. Thus, Edgar addresses all aspects of claim 4. The subject matter claimed in claim 3 (as interpreted above) follows directly from the teachings of Edgar since, having determined the location of the film defect (i.e. the reference feature), that film defect is in effect positioned with respect to its location. This would, therefore, address all aspects of claim 3.

13. *The following is in regard to Claim 7.* The method Edgar employs a technique known as "digital stitching" which involves the alignment of image data captured a various times during the film development process (Edgar, column 4, lines 53-54). The image data is captured by a scanner (Edgar column 8, lines 12-13). Such devices typically consist of a plurality of sensors. Also see Fig. 3. Therefore, given the discussion above with respect to claim 1, it can be seen that Edgar addresses all aspects of claim 7.

14. *The following is in regard to Claim 8.* The method of Edgar involves the detection and correction (i.e. the reduction of appearance) of film defects such as scratches and noise in the digital image derived from the adjusted

---

† Note that the maximum and minimum amounts of light (where *amount of light* is being interpreted either as *exposure* or *density*) are also identified, albeit not explicitly, in the method of Edgar. These values are apparent from Figs. 2a-2b and 5A.

image data. See Edgar, columns 6, lines 65-67 to column 7, lines 1-35. Therefore, given the discussion above with respect to claim 1, it can be seen that Edgar addresses all aspects of claim 8.

15. *The following is in regard to Claims 16-19, 22-23, and 25.* These claims recite substantially the same limitations as claims 1-4 and 7-8 respectively, where it would be readily understood by one of ordinary skill in the art that a system for improving the quality of image data, which utilizes digital image data, would inherently incorporate some processor and logic resident on that processor to perform the various operations claimed in claims 1-4, and 7-8. Therefore, with regard to claims 16-19 and 22-23, remarks analogous to those presented above with respect to claims 1-4, and 7-8 are respectively applicable.

16. *The following is in regard to Claims 31-34, 37-38, and 40.* These claims recite substantially the same limitations as claims 1-4 and 7-8, respectively, where it would be readily understood by one of ordinary skill in the art that a system or apparatus that supports digital images (recall how these claims are being interpreted) would inherently incorporate a computer readable medium (e.g. a disk or RAM) and a plurality or pixels, residing on that computer readable medium, which represent the image. Therefore, with regard to claims 31-34, and 37-38, remarks analogous to those presented above with respect to claims 1-4, and 7-8 are respectively applicable.

Rejections Under U.S.C. § 103(a)

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

18. Claims 5, 9-11, 20, 24-26, 35, and 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edgar, in view of Kaplan (U.S. Patent 4,977,521).

19. *The following is in regard to Claim 5.* As shown above, Edgar teaches a method in accordance with claim 1. Edgar, however, does not teach a method, in accordance with claim 1, wherein adjusting comprises normalizing

the data in response to one of the group consisting of a maximum level of light to be captured from the film and a minimum level of light to be captured from the film.

20. Applications abound involving the normalization of data, be it image data or otherwise, to lie within some prescribed range spanning the minimum and maximum values of that set of data. For example, Kaplan discloses a method for improving images obtained from photographic film (Kaplan, column 1, lines 5-10), wherein the image data is normalized to be within the range spanning the minimum and maximum detected densities, which are representative of the minimum level and maximum levels of light, respectively. See Kaplan, column 7, lines 48-64.

21. Observe the similarity of the photographic production system depicted in Figs. 4 and 7of Kaplan and that which is depicted in Figs. 3 and 9 and further described in *DUPLEX FILM SCANNING* of Edgar. Given the functional and structural similarity (particularly the fact that both fundamentally involve the scanning of an image and subsequently correcting it), it would have been straightforward for one of ordinary skill in the art to combine the methods of Edgar and Kaplan, so as to obtain a method, in accordance with claim 1, which includes normalizing the captured image data, according to the method of Kaplan. According to Kaplan (Kaplan, column 5, 20-26), it can be shown that the algorithm of Kaplan's method adjusts the captured image data optimally, in the sense that the mean square error for the exposure level is minimized. Given this advantage and the straightforwardness of such a modification, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to combine the methods of Edgar and Kaplan, so as to obtain a method, in accordance with claim 1, which includes normalizing the captured image data, according to the method of Kaplan. In doing so, one obtains a method that conforms to claim 5.

22. *The following is in regard to Claim 9.* As shown above, Edgar teaches a method in accordance with claim 1. Edgar, however, does not teach a method, in accordance with claim 1, wherein identifying the feature comprises comparing at least a portion of the reference feature to at least one threshold value. The method taught by Kaplan, on the other hand, detects scratches (i.e. reference feature) by taking note of any computed probabilities below threshold ("unreasonable" values). See Kaplan column 13, lines 45-48.

23. It was demonstrated above, with respect to claim 5, that the methods of Edgar and Kaplan are compatible. Furthermore, the motivation to incorporate the usage of thresholds taught by Kaplan into the method of Edgar is the optimality of Kaplan's method (Kaplan, column 5, 20-26), as discussed above. Given this advantage, the

advantageous removal of "unreasonable" values that Kaplan's method provides, and the straightforwardness of such a modification, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to combine the methods of Edgar and Kaplan, so as to obtain a method, in accordance with claim 1, wherein identifying the feature comprises comparing at least a portion of the reference feature to at least one threshold value. In doing so, one obtains a method that conforms to claim 9.

24. *The following is in regard to Claim 10.* As shown above, Edgar teaches a method in accordance with claim 1. It was shown above that Edgar's method implicitly identifies film defects (i.e. the reference feature) by comparing a pattern of signals derived from data captured from the film with an expected pattern. Kaplan describes the same, though more explicitly. See column 12, lines 49-56. The probability P(E), described therein, is then used to identify film defects (i.e. reference features).

25. It was demonstrated above, with respect to claim 5, that the methods of Edgar and Kaplan are compatible. Furthermore, the motivation to combine the two methods is the optimality of Kaplan's method (Kaplan, column 5, 20-26), as discussed above. Given this advantage, the advantageous identification of film defects that Kaplan's method provides, and the straightforwardness of such a modification, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to combine the methods of Edgar and Kaplan, so as to obtain a method, in accordance with claim 1, identifying the feature comprises comparing a pattern of signals derived from data captured from the film with an expected pattern. The obtained method would conform to claim 10.

26. *The following is in regard to Claim 11.* As shown above, Edgar teaches a method in accordance with claim 1. Edgar, however, does not teach a method, in accordance with claim 1, wherein identifying the feature comprises adaptively filtering a pattern of signals derived from data captured from the film in response to changes in the density of the film with an expected pattern of signals. The method taught by Kaplan, on the other hand, in deriving the probability distribution used to identify film defects, employs a filter tuned to the color of the positive dye to derive a positive dye density, during an initial scan, and a filter tuned to the color of the negative dye to derive a negative dye density, during a subsequent scan. See Kaplan, column 2, lines 65-67 to column 3, lines 1-2 and column 7, lines 1-21. In this regard, the filtering of the image signals is *adapted* to the density changes of the film.

27. It was demonstrated above, with respect to claim 5, that the methods of Edgar and Kaplan are compatible. Furthermore, the motivation to combine the two methods is the optimality of Kaplan's method (Kaplan, column 5, 20-26), as discussed above. Given this advantage, the advantageous responsiveness to density changes that Kaplan's adaptive filtering provides, and the straightforwardness of such a modification, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to combine the methods of Edgar and Kaplan, so as to obtain a method, in accordance with claim 1, wherein identifying the feature comprises adaptively filtering a pattern of signals derived from data captured from the film in response to changes in the density of the film with an expected pattern of signals.

28. *The following is in regard to Claims 20, and 24-26.* These claims recite substantially the same limitations as claims 5, and 9-11 respectively, where it would be readily understood by one of ordinary skill in the art that a system for improving the quality of image data, which utilizes digital image data, would inherently incorporate some processor and logic resident on that processor to perform the various operations claimed in claims 5, and 9-11. Therefore, with regard to claims 20, and 24-26, remarks analogous to those presented above with respect to claims 5, and 9-11 are respectively applicable.

29. *The following is in regard to Claims 35, and 39-41.* These claims recite substantially the same limitations as claims 5, and 9-11, respectively, where it would be readily understood by one of ordinary skill in the art that a system or apparatus that supports digital images (recall how these claims are being interpreted) would inherently incorporate a computer readable medium (e.g. a disk or RAM) and a plurality or pixels, residing on that computer readable medium, which represent the image. Therefore, with regard to claims 35, and 39-41, remarks analogous to those presented above with respect to claims 5, and 9-11 are respectively applicable.

30. Claims 6, 21, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edgar, in view of Gonzalez and Woods ("Digital Image Processing", 1993).

31. *The following is in regard to Claim 6.* As shown above, Edgar teaches a method in accordance with claim 1. Edgar, however, does not teach a method, in accordance with claim 1, wherein adjusting comprises equalizing the

data in response to one of the group consisting of a maximum level of light to be captured from the film and a minimum level of light to be captured from the film.

32. Histogram equalization of digital images is a well-known and oft-practiced technique for improving the quality of digital images. Histogram equalization is discussed rigorously in Gonzalez and Woods (*Histogram Equalization*, pp. 173-180). Histogram equalization employs a monotonic, non-linear mapping (i.e. T(r) – see page 173 of Gonzalez and Woods) which re-assigns the intensity values of pixels in the input image such that the output image contains a uniform distribution of intensities (*i.e.* a flatter histogram – see page 176 of Gonzalez and Woods). Note that histogram equalization is sensitive to the minimum and maximum intensities (i.e. level of light). See equation (4.2-9) on page 178 of Gonzalez and Woods and note that the range of intensities k range from 0...L-1, where 0 is the minimum intensity and L-1 the maximum intensity. These values define the range of colors that can appear in the equalized image and can control the spreading of histogram peaks.

33. Histogram equalization is known to advantageously improve the contrast of an image and enhances image detail. Being that it is a standard digital image correcting technique, it would be a simple enterprise for one of ordinary skill in the art to incorporate into the method taught by Edgar, discussed above with regard to claim 1, thereby applying it to the digital images captured from the film at various development times. Given the ease of such a modification and the advantages of histogram equalization, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to apply histogram equalization to the digital images captured from the film at various development times in the method of Edgar, thereby improving the contrast and overall quality of the captured images. In doing so one would obtain a method, in accordance with claim 1, wherein adjusting comprises equalizing the data in response to one of the group consisting of a maximum level of light to be captured from the film and a minimum level of light to be captured from the film.

34. *The following is in regard to Claim 21.* This claims recites substantially the same limitations as claim 6, where it would be readily understood by one of ordinary skill in the art that a system for improving the quality of image data, which utilizes digital image data, would inherently incorporate some processor and logic resident on that processor to perform the various operations claimed in claims 6. Therefore, with regard to claims 21, remarks analogous to those presented above with respect to claim 6 are applicable.

35. *The following is in regard to Claims 36.* These claims recite substantially the same limitations as claim 6, where it would be readily understood by one of ordinary skill in the art that a system or apparatus that supports digital images (recall how these claims are being interpreted) would inherently incorporate a computer readable medium (e.g. a disk or RAM) and a plurality or pixels, residing on that computer readable medium, which represent the image. Therefore, with regard to claims 36, remarks analogous to those presented above with respect to claim 6 are applicable.

36. Claims 12, 27, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edgar, in view of Warnick et al. (U.S. Patent 6,195,458).

37. *The following is in regard to Claim 12.* As shown above, Edgar teaches a method in accordance with claim 1. Edgar, however, does not teach a method, in accordance with claim 1, wherein identifying the feature comprises:

a. Generating a first histogram comprising first values derived from data captured from the film at a first development time;

b. Comparing the first values with second values in a second histogram derived from data captured from the film at a second development time;

c. Identifying at least a portion of the first values as the reference feature if the portion has developed at a rate different from the remainder of the first values in response to the comparison.

38. Warnick et al. disclose a method for detecting an object (i.e. a shot boundary) from an image that is one of a temporal sequence of images (Warnick et al., *Shot Boundary Detection).* That method includes:

a. Generating a first histogram comprising first values derived from an image captured at a first time. Refer to the equation in column 5 of Warnick et al. In that equation, H_{I-1} is a histogram generated from a frame image, I-1, which can be assumed to have been captured at a first time (see, for example, Warnick et al. column, first paragraph).

b. Comparing the first values with second values in a second histogram derived from an image captured at a second time. Again referring to the equation in column 5 of Warnick et al., note that H_I is a histogram generated from an immediately subsequent frame image I, which can similarly

be assumed to have been captured at a subsequent time. The value HD is the color histogram absolute difference comparison metric. HD, therefore provides a comparison of the values of H_I (i.e. $H_I(j)$) with the values of H_{I-1} (i.e. $H_{I-1}(j)$).

c. Identifying at least a portion of the first values as the reference feature if the portion has a rate of change different from the remainder of the first values in response to the comparison. The classification/clustering procedure described in Warnick et al., column 6, lines 55-60, divides histogram data into two *statistically significant* (Warnick et al. column 6, line 46) classes, one corresponding to the object being sought (i.e. the shot boundary) and the other corresponding to non-object locations. The separation of data into these disjoint classes is predicated on the evaluation of HD, where, again, HD is a measure of the change from histogram H_{I-1} to histogram H_I over the time spanning the first time and a subsequent time. In this regard, HD provides a measure of the temporal rate of change of the image frames constituting the said temporal sequence of images.

While Warnick et al.'s teachings (i.e. the discussion in Warnick et al. column 5, lines 5-67 to column 6, lines 1-60) are directed toward captured video sequences, it would be clear to one of ordinary skill in the art that the detection and classification method, discussed therein, may just as well be applied to the sequence of images captured from a developing film at various development times. This is because, like captured video sequences, images captured in this manner represent a temporal sequence of images. As such, the detection/classification method of Warnick et al. may be applied to the images captured in the manner taught by Edgar, that is, image captured from film at various times during its development. The aforementioned detection method of Warnick et al., particularly the HD metric, advantageously provides a means for detecting changes in an image over time. Furthermore, as indicated by Warnick et al. (Warnick et al. column 6, lines 41-45), the aforementioned clustering/classification method advantageously provides a means for attributing these changes to object and non-object regions of the sequential images such that an optimum classification is achieved, devoid of user-defined or application-specific thresholds. Given the shown applicability of Warnick et al.'s detection and classification method to the captured image data, discussed above with regard to claim 1, the advantageous features of Warnick et al.'s method, and the improved functionality achieved by the incorporation of Warnick et al.'s method, it would have been obvious to one of

ordinary skill in the art, at the time of the applicant's claimed invention, to employ Warnick et al.'s detection and classification method in the electronic film development method taught by Edgar, thereby obtaining a method, in accordance with claim 1, further capable of feature identification conforming to that which is claimed in claim 12.

39. *The following is in regard to Claim 27.* This claims recites substantially the same limitations as claim 12, where it would be readily understood by one of ordinary skill in the art that a system for improving the quality of image data, which utilizes digital image data, would inherently incorporate some processor and logic resident on that processor to perform the various operations claimed in claims 12. Therefore, with regard to claims 27, remarks analogous to those presented above with respect to claim 12 are applicable.

40. *The following is in regard to Claims 42.* These claims recite substantially the same limitations as claim 12, where it would be readily understood by one of ordinary skill in the art that a system or apparatus that supports digital images (recall how these claims are being interpreted) would inherently incorporate a computer readable medium (e.g. a disk or RAM) and a plurality or pixels, residing on that computer readable medium, which represent the image. Therefore, with regard to claims 42, remarks analogous to those presented above with respect to claim 12 are applicable.

41. Claims 13, 28, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edgar, in view of Warnick et al, in further view of Van de Poel et al. (U.S. Patent 6,061,091).

42. *The following is regard to Claim 13.* As shown above, with regard to claim 12, the teachings of Edgar and Warnick et al., combined in the method discussed above, teaches all aspects of claim 12. As mentioned above, the detection/classification method taught by Warnick et al. separates the histogram data into two *statistically significant* classes. Warnick et al. do not suggest, however, that these statistically significant classes correspond to flare and non-flare data.

43. Van de Poel et al. discloses a method that detects and corrects specular reflections, such as glare or flare[‡], in digital images. Specular reflections, such as glare or flare, are statistically significant, as evidenced by the

‡ In the photographic art, glare is often taken to be synonymous with flare.

histogram shown in Fig. 2 of Van de Poel et al. The histogram in Fig. 2 or Van de Poel et al. also illustrates the statistical significance of the main scene. Furthermore, flare is known to degrade the quality of a photograph and is, therefore, undesirable. Given the statistical significance of flare and its undesirability, as well as the statistical significance of the main scene, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to configure the method obtained by the teachings of Edgar and Warnick et al., combined in the manner discussed above with regard to claim 12, to detect two statistically significant classes corresponding to flare and the main scene. The main scene can, for all intents and purposes, be considered as the reference feature. Therefore, by combining the teachings of Edgar, Warnick et al., and Van de Poel et al., in the manner just described, one obtains a method, in accordance with claim 12, further comprising identifying the remainder[§] of the first values as a flare.

44. *The following is in regard to Claim 28.* This claims recites substantially the same limitations as claim 13, where it would be readily understood by one of ordinary skill in the art that a system for improving the quality of image data, which utilizes digital image data, would inherently incorporate some processor and logic resident on that processor to perform the various operations claimed in claims 13. Therefore, with regard to claims 28, remarks analogous to those presented above with respect to claim 13 are applicable.

45. *The following is in regard to Claims 43.* These claims recite substantially the same limitations as claim 13, where it would be readily understood by one of ordinary skill in the art that a system or apparatus that supports digital images (recall how these claims are being interpreted) would inherently incorporate a computer readable medium (e.g. a disk or RAM) and a plurality or pixels, residing on that computer readable medium, which represent the image. Therefore, with regard to claims 43, remarks analogous to those presented above with respect to claim 13 are applicable.

46. Claims 14, 29, and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edgar, in view of Willoughby, Jr. et al. (U.S. Patent 5,619,587).

---

§ The remainder of the first values is simply taken as those values the complement of the set of values attributed to the reference feature.

47. *The following is regard to Claim 14.* As shown above, Edgar teaches a method in accordance with claim 4. Edgar, however, does not teach a method, in accordance with claim 4 (and, therefore, claim 1), wherein determining the location of the feature comprises:

a. Determining a maximum value of a plurality of rates of change calculated between a plurality of pairs, each pair comprising at least two adjacent values from at least a portion of a column of values captured from film while the film has developer chemicals applied thereto, the column of values disposed generally in a y direction parallel to a surface of the film and perpendicular to a first film edge and a second film edge both along an x direction of the film;

b. Determining a closest relative maximum value of the calculated rates of change to a selected pixel in the column of values;

c. Identifying the location of at least a portion of a first image extent in response to the location of the closest relative maximum value.

48. Willoughby, Jr. et al. disclose a method detecting and locating an object contained in a captured pixel image (Willoughby, Jr. et al. column 3 lines 63-67 to column 4, lines 1-15). The method includes:

a. Determining a maximum value of a plurality of rates of change calculated between a plurality of pairs of pixels, each pixel pair comprising at least two adjacent values from at least a portion of a column of values captured from the captured pixel image, the column of values disposed generally in a y direction parallel to a surface of the film and perpendicular to a first image edge and a second image edge both along an x direction of the image. Refer to Willoughby, Jr. et al. column 11, lines 5-30. Here, the method of Willoughby, Jr. et al. calculates the gradient successive pixels, in a row-by-row or column-by-column direction, where it is understood that columns and rows are perpendicular and parallel to the vertical and horizontal edges of the (rectangular) captured image, respectively. The gradient represents a rate of change for successive pixels, the maximum of which is determined per row or column.

b. Determining a closest relative maximum value of the calculated rates of change to a selected pixel in the column of values. Refer to Willoughby, Jr. et al. column 11, lines 24-30 and the previous discussion relating to item (a).

c. Identifying the location of at least a portion of a first image extent in response to the location of the closest relative maximum value. Refer to Willoughby, Jr. et al. column 11, lines 20-30. The borders discussed therein can be considered the first image extent.

Application of gradient edge detection algorithms to pixel images has long been practiced in digital image processing. Since, the method of Edgar captures digital images of a film, the object edge detection described by Willoughby, Jr. et al. is assumably compatible with the method, conforming to claim 4, that is taught by Edgar. Furthermore, simple gradient edge detection algorithms, such as Willoughby, Jr. et al.'s, are attractive because of their relatively low computational complexity and simplicity of implementation. Therefore, given the applicability of Willoughby, Jr. et al.'s detection method to captured images such as those obtained by Edgar's method, and given the advantageous simplicity of Willoughby, Jr. et al.'s method as an object detection method, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to combine the teachings of Willoughby, Jr. et al. and Edgar so as to use Willoughby, Jr. et al.'s method for the purpose of locating a reference feature (e.g. a film defect) within a digital image captured from a film while it is being developed, the image being obtained according to the method taught by Edgar and conforming to claim 4. In doing so, one would obtain a method in accordance with claim 14.

49. *The following is in regard to Claim 29.* This claims recites substantially the same limitations as claim 14, where it would be readily understood by one of ordinary skill in the art that a system for improving the quality of image data, which utilizes digital image data, would inherently incorporate some processor and logic resident on that processor to perform the various operations claimed in claims 14. Therefore, with regard to claims 29, remarks analogous to those presented above with respect to claim 14 are applicable.

50. *The following is in regard to Claims 44* These claims recite substantially the same limitations as claim 14, where it would be readily understood by one of ordinary skill in the art that a system or apparatus that supports digital images (recall how these claims are being interpreted) would inherently incorporate a computer readable medium (e.g. a disk or RAM) and a plurality or pixels, residing on that computer readable medium, which represent the image. Therefore, with regard to claims 44, remarks analogous to those presented above with respect to claim 14 are applicable.

51. Claims 15, 30, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edgar, in view of Lapidus et al. (U.S. Patent 4,581,762).

52. *The following is in regard to Claim 15.* As shown above, Edgar teaches a method in accordance with claim 4 (and, therefore, claim 1). Edgar, however, does not teach a method, in accordance with claim 4, wherein determining the location of the feature comprises:

a. Determining a plurality of rates of change calculated between a plurality of pairs, each pair comprising at least two adjacent values from at least a portion of a row of values captured from image, the row of values oriented generally in the x direction parallel to a surface of the image and to a first image edge and a second film edge both along the x direction, the x direction perpendicular to a y direction across the image;

b. Comparing the rates of change to an expected signature of a feature;

c. Identifying the location of the feature in response to the comparison.

53. Lapidus et al. disclose a method of object/feature (objects/features including defects – Lapidus et al. column 8, lines 1-5 and column 22, lines 1-39) location (Lapidus et al., *OBJECTS OF THE INVENTION*) within a captured image, wherein determining the location of the feature comprises:

a. Determining a plurality of rates of change calculated between a plurality of pairs, each pair comprising at least two adjacent values from at least a portion of a row of values captured from image, the row of values oriented generally in the x direction parallel to a surface of the image and to a first image edge and a second film edge both along the x direction, the x direction perpendicular to a y direction across the image. See, for example, Lapidus et al. column 15, lines 40-51. Again, The gradient represents a rate of change for successive pixels, the maximum of which is determined per row or column. Gradients are calculated over 40×32 search area. This area includes at least a portion of a row of values captured from image, where it is understood that columns and rows are perpendicular and parallel to the vertical and horizontal edges of the (rectangular) captured image, respectively.

b. Comparing the rates of change to an expected signature of a feature. See, for example, Lapidus et al. column 15, lines 65-68 and column 26, lines 49-53. There, the gradient information for the template represents an expected or known signature of a feature or object, which is compared (i.e. correlated – see, for example, Lapidus et al. column 27, lines 19-23) to the gradient (rate of change) information of the aforementioned section of the captured image.

c. Identifying the location of the feature in response to the comparison. See, for example, Lapidus et al. Figs. 9C-9E and the corresponding discussion in the description.

Lapidus et al. demonstrate the applicability of their method to captured digital image. Since, the method of Edgar captures digital images of a film, the feature (defect) detection described by Lapidus et al. is assumably compatible with the method, conforming to claim 4, that is taught by Edgar. The Sobel gradient calculation and "template matching" matching at the heart of Lapidus et al.'s method, provide rapid identification and orientation of an object or feature (Lapidus, et al. column 3, lines 20-23) that is advantageously simple in design (see, for example, Lapidus et al. Figs. 9A-9B) and responsive to changes in orientation of the feature relative to the reference signature (template – e.g. Lapidus et al. column 2, lines 63-67). Given the compatibility of Lapidus et al.'s method with that of Edgar and the advantageous features of Lapidus et al.'s method as a feature location method, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to combine the teachings of Lapidus et al. and Edgar, so as to use Lapidus et al.'s method for the purpose of locating a feature (e.g. a film defect) within a digital image captured from a film while it is being developed, the image being obtained according to the method taught by Edgar and conforming to claim 4. In doing so, one would obtain a method in accordance with claim 15.

54. *The following is in regard to Claim 30.* This claims recites substantially the same limitations as claim 15, where it would be readily understood by one of ordinary skill in the art that a system for improving the quality of image data, which utilizes digital image data, would inherently incorporate some processor and logic resident on that processor to perform the various operations claimed in claims 15. Therefore, with regard to claims 30, remarks analogous to those presented above with respect to claim 15 are applicable.

55. *The following is in regard to Claims 45* These claims recite substantially the same limitations as claim 15, where it would be readily understood by one of ordinary skill in the art that a system or apparatus that supports

digital images (recall how these claims are being interpreted) would inherently incorporate a computer readable medium (e.g. a disk or RAM) and a plurality or pixels, residing on that computer readable medium, which represent the image. Therefore, with regard to claims 45, remarks analogous to those presented above with respect to claim 15 are applicable.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Siangchin whose telephone number is (703) 308-6604. The examiner can normally be reached on 9:00am - 5:30pm, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin Siangchin

Examiner
Art Unit 2623

ks - 02/09/04

AMELIA M. AU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600